Q & A

Distributed Energy Road Show

Austin, TX
May 30, 2003

DE: National Perspective

Q: Regarding your slide about electricity losses, isn't a fluorescent light 80% efficient?
A: The slide demonstrates the relative energy losses at the end point, beginning with the fuel consumption – not the efficiencies of the items themselves

Q: (Anne-Marie to participants) What building codes does Texas use?
A: International Codes for 2000

Combined Heat and Power: Applications and Benefits

Q: If a healthcare facility uses its emergency generator for CHP, would it still be considered an emergency unit, or a baseload unit?
A: There might be issues with that – for example, emergency units are typically permitted to run only a certain number of hours per year. For a healthcare facility that wants to use its asset (the generator), it could replace its emergency generator with a lean burning machine and re-permit it to run for more hours.

Q: Is re-permitting an environmental issue?
A: The air quality district and state EPA would want to permit it—engines previously installed were typically diesel—that's why they would need to be replaced

Q: Regarding your slide on NOx implications – you show fuel cell NOx emissions. But in the global warming slide you don't show fuel cell implications – are there global warming implications for fuel cells?
A: There are none. If you use natural gas as a source for extracting hydrogen fuel, CO2 is a by-product of reformation –so, you can't look only at what comes out of the tail pipe when considering environmental impacts. Impacts also depend on what type of fuel is used initially.

Comment: If you re-deploy the heat that comes from the fuel cell you would significantly lower the minimal environmental impacts the fuel cell has—if you recover the waste heat you could potentially displace a boiler. CHP is the key to onsite generation – when you evaluate a potential application, consider the benefits and available credits – particularly in Texas, where you have NOx and CO2 restrictions – CHP can help users meet regulatory requirements.

Q: Why didn't you mention heat recovery on reciprocating engines?
A: Heat recovery can be used on reciprocating engines but it is a lower grade heat source than the other technologies I mentioned.

Q: But it is still considerable heat, isn't it – couldn't it be used for desiccants?

A: Yes

Q: The fuel cell cost you mentioned – is that the cost for equipment only?
A: No – it is the installed cost

Q: What the temperature of the water from the chiller?
A: 42-43 degrees.

Q: Does it use lithium bromide?
A: Yes – it's not a refrigerant – water is used as a refrigerant

Microturbines: Installation and Operation

(Larry Guzy, Capstone Turbine Corp. portion)

Q: How much does a 60 kW with battery pack weigh?
A: 2200 lbs

Q: What about a 30 kW unit?
A: 970 lbs

Q: How much does it cost?
A: Approximately $1000 per kW. For a biogas application it would cost about $1000-$1400 per kW (extra cost to clean the biogas fuel on which it would run). It would be a good idea to hire a third party fuel processing company to put the cleaning system together for you rather than put the cleaning system together yourself—it would help save money.

(Doug Witkowski, Lower Colorado River Authority Case Study portion)

Q: If you want to reconfigure a unit you already own to island it, what would you do?
A: We looked into that, and it wasn't too expensive – but I can't remember the price quote

Q: What is the turbine speed?
A: 96,000 RPM

General questions regarding microturbines

Q: How many of the units in operation are running in the U.S. and Europe, etc.? What is the U.S. market consumption?
A: California had a significant number of units installed, Japan has some installations—multi-pack units work well there, but it is typically thought that Europe has the greatest potential because of the region's huge CHP regulatory requirements

Q: How do you counsel customers regarding gas commodity issues (for example, fluctuations in the market)?
A: A turbine user can lock in a certain price of gas over a specified period of time

Comment: That is easier for a utility than an individual end user

Local Interconnection

Q: Regarding your comment that DG does not have an impact on the grid, what about a PV array on a house? PV systems connected to the grid cannot work if there is a power outage unless it has a battery with additional electronics.

A: I meant that DG does not change the voltage or frequency of the transmission and distribution system.

Comment: You can pay $3000-$5000 for a microprocessor relay – the list price for our system is $1800 and includes inverter relays

Q: The efficiency of an inverter system is important – isn't the inverter what needs the most work?
A: The inverter systems help avoid extra costs of protection devices in addition to the DG system

Comment: The issues is that there is no DC voltage standard – that's why we have to use the inverters and that's what causes power loss

Q: Is net metering an issue for interconnection?
A: We can install meters for this

Q: But is it an issue?
A: Normally not – protection is our biggest issue

Comment: Our older meters – a majority of them residential – will automatically reverse if the power flows into it and subtract kWh – it happens automatically. However, with the newer networked systems, it could be problematic.

Texas Distributed Generation Programs – State Energy Conservation Office

Q: I thought solar thermal was cheaper than PV
A: This might be an old slide – I'll check into that

Q: How big are the solar panels from the pictures?
A: 220 square feet (10 watts per square foot) – the inverter takes up about a 3-foot by 5-foot space on the wall

Q: What is the lifespan of one of the solar panels?
A: They are warranted for 20 years usually. At the National Renewable Energy Laboratory there are panels that have been operating for 20 years – there is degradation over time, though.

Q: How big is the fuel cell?
A: 5-7 kW

Q: Is it installed yet?
A: I believe so

Q: The Regulatory Assistance Project was heading up a national permitting standard – are they still doing that? What is the standard and how does it compare to Texas standards?
A: There is a state level interconnection and emissions draft standard on their web site (www.rapmaine.org). But there is no legislative authority on this at the national level. The public comment period is still open. RAP is trying to develop state interconnection standards like P1547 and is working with the Federal Energy Regulatory Commission to accept it as well – it is also reference in the pending energy bill. It still has to be dealt with on the state level here.

Photovoltaics: Installation and Operation

Q: Is the NABCEP considering other technologies in addition to solar PV?
A: Yes – they are looking at other technologies, but right now they are focused on solar

Q: Where is the outdoor disconnect switch located?
A: Right next to the outside distribution panel – it has a red handle and is clearly marked. There is also a breaker that ties the PV system into the load—this can also be shut off.

Q: If all of the breakers are shut off, would the PV system shut off?
A: Yes – if you shut off the main breaker it will turn the system off.

Comment: Another disconnection method is a fuse disconnect that goes from the PV array to the inverter

Q: When the meter runs backward – does it give the user a credit on his electricity bill?
A: That's right

Q: What about street lights and other things owned by the city?
A: I don't think those are metered at all.

Q: Regarding slide #18, what are the typical issues for utility interconnection?
A: Insurance and interconnection fees – homeowners insurance should suffice for residential applications. Some coops require interconnection fees, but I'm not sure how much they are – I don't think they're high – there's not a lot of understanding and there are some fears – more education is needed.

Q: Are the regulatory issues specific to PV or do they apply to DG in general?
A: Voltages can be unique for PV – there is DC and AC current in the same system – a lot of this is protection.

Q: So they aren't an excessive burden or overkill?
A: No – this is mostly for safety – the only overkill item I can think of is the DC disconnect because there are breaker disconnects – but it's not ridiculous because it is easily identifiable by people who aren't familiar with the technologies.

Comment: You can see with PV that there are lots of developed codes – this has been around for 20 years – it is also grid connected. Hopefully other forms of DG can follow in its footprints.

Q: So there will be similar codes and standards for microturbines and fuel cells?
A: Yes, anything PV has had to get through, other DG systems will go through also.

Comment: Codes and standards also establish quality components. They have been developed to help manufacturers use a uniform standard for equipment – everything will be utility grade.

Q: What are the installation costs for the system across the street?
A: Approximately $8 per watt for the total system installed

Q: What is the output?
A: We expect this system to have a 30-year life, and we expect to get 1800 kWh per rated kW per year – there are 34 panels, so 34 multiplied by 1800 kWh/year for 30 years

Fuel Cells: Installation and Operation

Q: What metal is used in solid oxide fuel cells?
A: There are hundreds of materials that can be used – they all operate differently at different temperatures and have different efficiencies

Q: Why aren't you using CHP in the demonstration?
A: At the time of the proposal we looked into that, and our team decided we wanted to be non-invasive with the residences involved in the study, so we decided not to use it.

Q: What types of fuel cells are used in the demo?
A: Proton exchange membrane

Q: How much heat is produced per hour?
A: If they are running at 30-35% efficiency, 10-12% of the heat is exhausted

Q: Are there other heat losses that don't go through the stack?
A: Yes – thermal processing

Q: Are the fuel cells running separately or in parallel?
A: They are running separately, and the data for each can be viewed separately.

Q: Have the residences been exercising energy efficiency?
A: Not formally – it would be a good follow on analysis project, though.

Q: On the interfaces slide (on page 8) the illustration shows a connection to the water system. What is the purpose of this?
A: Most fuel processors require water to extract hydrogen from natural gas – the membrane needs moisture to function as well.

Q: What is the water consumption of the unit?
A: It's minimal.

Q: Are you gathering emissions data as part of this project?
A: No, but we did an initial analysis when we started the project – just not in real time like the other data we are collecting.

Hydrogen

Comment from speaker at beginning of presentation: The first microwave ovens cost $400,000 and were made by Amana Corp. Now you can get a Sharp Corp. microwave at Walmart for $29.95.

Q: The pictures you showed us of mobile applications – are they still running today?
A: Probably not. They were demos used to accumulate hours and run tests to gain experience – the programs are still alive, and the observations were used to make codes and standards.

Austin Energy and Distributed Generation

Q: What is Austin Energy doing in regards to distributed generation?
A: Domain 4.5 MW turbine with chiller, fuel cell at RBJ health center for testing and observation (only took about 4 months to get it installed and operating)

- Our next phase is cost-sharing – we plan to engage in partnerships with DOE, DOD, and UT and to ask customers to buy down projects
- One problem we are encountering is that there aren't a lot of commercial fuel cells installed right now, and the ones that are operating are already becoming outdated. Fuel cell companies are already making next generation units and discontinuing the lines that are now installed.

Q: Does Austin Energy have a MW goal for DG?
A: We are developing one right now – I'm looking at technologies and then working on projects, instead of vice versa. We currently have a renewable energy goal of obtaining 5% of our power from renewable resources by 2005 (wind, solar, hydro, biogas). Right now we have about 2.5%.

Structured Discussion

Q: Anne-Marie to participants: What else do you want to learn about distributed energy?
A:

- A total renewable system – for example, solar electrolyzers used to make hydrogen, which then powers a fuel cell.
- DG portfolio standards that other states, utilities, municipalities are developing (similar to renewable portfolio standards)
- Financial justifications for DG – individual case studies, real costs, liabilities, etc.
- What is the role for DG – specific for microturbines, fuel cells – anything less common than PV

Q: What is the status of total renewable systems like the one mentioned?
A: They are in the preliminary stages of development – it will be 5 years or so before we see anything significant in this area. Europe is pretty aggressive with research and development – they are planning to use off shore wind to create hydrogen.

Q: The key to DG success is natural gas. Will it still be plentiful 10 years from now?
A: We are lacking a proper infrastructure for our growing natural gas needs – building it is of concern. We could end up with a global liquid natural gas market, similar to our oil market.

Q: How do we get the permitting officials to attend these Road Show workshops?

A: Fire marshals do a lot of internal training and communication – information is distributed through captain schools. Also, demonstrating technologies that are more near-term would draw more fire safety inspectors – a lot of the technologies discussed today appear to be in the research phase and demonstrated for future use – technologies that are currently in use would help engage permitting officials.

Q: What is NIMBY like in Austin?
A: It's pretty bad – about 10 years ago there was a proposal to burn waste as a fuel for a generator and the idea was killed. It also depends on the location, and is driven by technologies. People want fuel cells but not necessarily engines—there is an educational need in this area.

Q: Are there wind farms in this part of the state?
A: Not in this area.